

***HT1.5 Site Dumper***  
***MAINTENANCE***  
***INSTRUCTION***  
***MANUAL***



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Dear Customer

Even if you have operated this type of equipment before, it is very important that your new equipment operations and instructions are explained to you by a Dealer Representative following delivery of your equipment.

This will explain the operating controls and enable you to gain maximum productivity from your new dumper.

# Foreword

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This manual has been produced to provide information on the correct operating and maintenance procedures for the NC Dumper

The procedures in this publication relate specifically to the NC Dumper

All information, specifications and illustrations used in this manual are correct at the time of issue. NC reserves the right to make changes in this manual at any time without prior notice.

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## EC – DECLARATION OF CONFORMITY

Machine description	:	Site Dumper
Make		NC
Type		HT1.5
Manufactured by		NC Engineering (Hamiltonsbawn) Ltd
Address:		2 Killyrudden Road, Hamiltonsbawn Richhill, Co. Armagh. BT61 9SF

This machinery has been designed and manufactured in accordance with the following European Standards: -

### 2006/42/CE: Machinery Directive

Measured Sound Power Level:	101 dB LWA
Guaranteed Sound Power Level:	101 dB LWA
Net Installed Power:	24.7kW

A technical construction file for this machine is retained at the above address.

Declaration

Signed: \_\_\_\_\_

Name: David Wilson CEng; MSc; MIAgrE

Being the responsible person appointed by the manufacturer (or nominated representative of the manufacturer established in the EC) and employed by:

**NC Engineering (Hamiltonsbawn) Ltd**

This declaration of Conformity complies with Regulation 22 of The Supply of Machinery (Safety) Regulations 1992

# Noise Level Declaration

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The noise levels are measured according to ISO6395:1998

The noise level of this machine is

$L_{WA}$  101dB ( A )

$L_{PA}$  85dB ( A )

$L_{WA}$  :- A - Weighted sound power level.

$L_{PA}$  :- A - Weighted sound pressure level.

# Vibration Declaration.

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The absence of a harmonised test code together with variable conditions under which this equipment may be used allows only representative figures to be quotes.

Whole Body Vibration Level :  $a_w$  (m/s<sup>2</sup>) = 0.4

Hand / Arm :  $a_{ha}$  ( m/s<sup>2</sup> )  $\ddot{O}$ 1.9

*The above figures are for reference purposes only. It is the responsibility of the employer to access vibration exposure based on the actual site conditions and operating practices at the point of use. Employers should not rely solely on published vibration figures when undertaking risk assessments. Depending on the site conditions cycle times may need to be adjusted in order to reduce operator exposure levels.*



# Technical Specifications

## FOURWHEEL DRIVE DUMPER

### CAPACITY:

Max. safe load:	1500 kg
Heaped:	825L
Struck:	658L
Water:	494L

### ENGINE:

Deutz D2009L03 3 Cylinder, Water Cooled, Naturally Aspirated	
Displacement:	1.7 L
Max. power:	24.7kW/33bhp @ 2500 rpm
Max. torque:	104Nm @ 1600 rpm
Emissions:	Euro 2 compliant

### TRANSMISSION:

Hydrostatic automotive "Twin Lock" permanent 4 wheel drive  
Acceleration by foot pedal & braking from hydrostatic retardation

### DRIVE CHARACTERISTICS:

Forward / Reverse	0-12 km/h (0-7.5 mph)
Steering angle:	+/- 36.5°
Turning Circle:	6.55m
Grade-ability:	50%
Tyres:	10.0 / 75 / 15.3 (traction Profile)
Steering:	Priority load sensing hydrostatic centre pivot
Working brakes:	Hydrostatic retardation
Park brake:	Automatic in rear wheel motors

### NOISE LEVELS:

LWA	101dB(A)
LPA	85dB(A)

### TANK CAPACITIES:

Fuel:	29L
Hydraulic:	29L

### SKIP:

Hydraulically operated skip tipping to 91°  
Heavy duty fully welded skip with 5mm thick steel, reinforced upper side walls for greater strength  
Operated by a multi axis joystick for increased performance

### ELECTRICAL:

Heavy duty 335 Battery: 12V, 95Ah  
Wiring harness in protective sleeving  
Reversing alarm

### HYDRAULICS:

35cc Automotive control hydrostatic pump @ 300 bar  
14cc Gear pump @ 170 bar  
Hydraulic test points fitted as standard  
Easy access return oil filter on top of tank

### SEATING & CONTROLS:

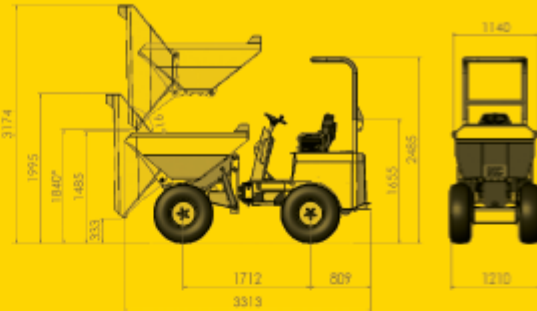
Adjustable suspension seat accessible from both sides  
Clear access across dumper via galvanised steps  
Super bright warning lights on fully featured display instrument  
Steel constructed centre console for extra leg protection  
Column mounted directional control lever  
Anti-slip floor

### SERVICE ACCESS:

Easy access for service maintenance  
Lockable hinged engine cover  
Battery mounted inside the engine bay

We reserve the right to change the above specifications without prior notice

## HT1.5



### FEATURES

- Unrivalled operator accessibility and comfort
- Excellent rough terrain performance from permanent 4-wheel drive
- Heavy duty construction; skip manufactured from 8mm steel plate and reinforced around top
- Column operated forward and reverse directions with acceleration by foot pedal
- Simple and safe operation; drive direction on the steering column
- Heavy duty centre console for leg protection
- Simple instrument panel including fuel gauge, hourmeter, warning lights for parking brake, oil temperature, oil pressure, engine temperature
- Folding ROPS as standard
- Easy access to engine compartment for service and maintenance
- Recovery bracket as standard
- 33.1 HP engine / 24.7 Kw
- Excellent power to weight ratio
- Theft deterrent Cesar Data Tag System as standard
- Ample ground clearance
- Excellent turning circle
- Reversing alarm standard
- Separate fuel and hydraulic filler compartments
- Skip tips over 90°
- Adjustable suspension seat

### OPTIONAL EQUIPMENT

- Road Light Kit
- Flashing Beacon
- Spare Wheel
- Biodegradable Hydraulic Oil
- FOPS Roof
- Skip manufactured from ST52 or Hardox
- Cab



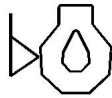
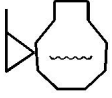

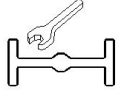
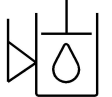
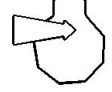


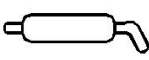
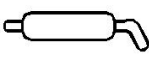
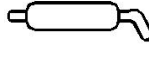
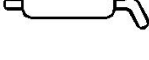
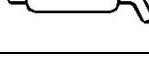
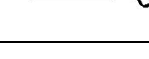
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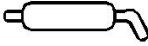
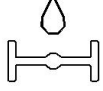





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# Maintenance Decal Descriptions

The machine is fitted with a maintenance decal. It is important that before using the machine the decal is understood and all the checks have been carried out. The decal must be clean and readable at all times. If the decal needs to be replaced it can be obtained from the NC Spares department.

Ref No.	Symbols	Description.
1		Engine oil level.
2		Engine coolant level.
3		Fuel and water sedimentor.
4		Axle service points.
5		Hydraulic oil level.
6		Air filter restriction indicator.
7		Engine oil filter.
8		Hydraulic return to tank filter.
9		Grease point - Skip pivot pins.
10		Grease point - Hi lift arm pins.
11		Grease point - Parallel link are pins.
12		Grease point - Tipping ram pins.
13		Grease point - Hi lift rams.
14		Grease point - Centre point articulation casting.







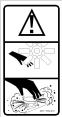


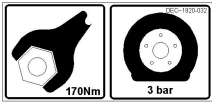
## Maintenance Decal Descriptions

Ref No.	Symbols	Description.
15		Grease point - Steering ram.
16		Axle oil.
17		Fuel filter ( Engine mounted )
18		Hydraulic oil.
19		Air filter element.
20		Engine coolant.
21		Engine checks.

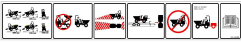
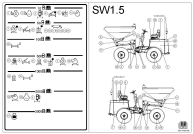

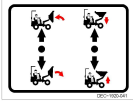


# Safety Decals and Descriptions

## ***SAFETY DECALS***

The Machine is fitted with a number of safety decals placed in areas to draw the attention of the users. It is important that before using the machine these decals are read and understood. The decals must be clean and readable at all times, if they need to be replaced they can be obtained from NC spares department.

Part No.	Symbol.	Descriptions.
DEC~1920-002		Hydraulic oil.
DEC~1920-003		Fuel.
DEC~1920-010		Ignition key positions.
DEC~1920-012		Seat belt must be worn.
DEC~1920-016		No repairs to ROPS.
DEC~1920-017		Pinch points.
DEC~1920-019		Caution moving parts / Do not open when hot.
DEC~1920-027		Fit skip prop before accessing area.
DEC~1920-031		Battery.
DEC~1920-032		Wheel nut torque / Tyre pressure.

## Safety Decals and Descriptions

Part No.	Symbol.	Descriptions.
DEC~1920-038		Safe gradients / Lower skip before moving / Visibility / Transport / No passengers / Towing / Read manual.
DEC~1920-039		Maintenance decal.
DEC~1920-040		Sound levels.
DEC~1920-041		Skip controls.
DEC~1920-042		Do not operate dumper without reading manual.
DEC~1920-044		Keep clear of tipping area.

# 1.5T HT Maintenance Manual

The following maintenance sections are provided to ensure safe working practices. The procedures in this booklet should be followed. No attempt should be made to shortcut any of the steps.



**You or others could be killed or seriously injured if the machine is not correctly prepared and maintained.  
Maintenance must be carried out by suitably qualified personnel only**

To ensure the best performance of the machine ensure the service tasks are carried out at the correct intervals (see service schedules)

If the machine is working in adverse conditions, then the service intervals should be reduced. Examples of adverse conditions are:

- Operating with low quality fuel (See **Fluids & Lubricants** section for more information)
- Operating in a very dusty environment
- Operating continuously at high engine load
- Operating in an environment with lots of chaff
- Operating in an extremely hot or cold environment
- Operating continuously on slopes
- Operating continuously at high altitude
- Operating in an environment with high humidity

# Service Record Sheet

## First 50 Hr.

Date í í í í í í .

Hour Reading í í í ..

## First 5000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 100 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 5500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 6000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 1000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 6500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 1500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 7000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 2000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 7500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 2500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 8000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 3000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 8500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 3500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 9000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 4000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 9500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 4500 Hr.

Date í í í í í í í .

Hour Reading í í í ..

## First 10000 Hr.

Date í í í í í í í .

Hour Reading í í í ..

**Note: It may be essential to change the engine Oil and Filter, Air Filter(s) and Fuel Filter(s) more frequently. Check machine service schedule and applications requirements.**

# Service Schedules

## CALENDAR EQUIVIVANTS

10Hours = Daily  
 50 Hours = Weekly  
 100 Hours = Fortnightly  
 500 Hours = Six Months  
 1000 Hours= Yearly  
 2000 Hours= 2 Years



**Service checks should be carried out at which ever interval occurs first. Do not use a machine which is due for a service. Make sure any defects found during the regular maintenance are rectified immediately. i.e. If the dumper has completed less than 2000 hours at the 2 year period carry out the 2000 hour service.**

<b>ENGINE</b>	<b>Service Points &amp; Fluid Levels</b>	<b>Operation</b>	<b>10 Hr</b>	<b>50 Hr</b>	<b>250 Hr</b>	<b>500 Hr</b>	<b>1000 Hr</b>	<b>2000 Hr</b>	<b>3000 Hr</b>
Oil level <sup>(1)</sup>		Check							
Coolant Quality / Level		Check							
Coolant or Oil Leaks		Check							
Fuel Pre Filter & Water Sedimentor <sup>(2)</sup>	Check for contamination & Drain								
V Belts	Check if necessary, re-tighten or renew								
Oil & Filter <sup>(3) (4) (5)</sup>		Change		<input type="checkbox"/>					
All Hoses & Electrical Cables	Condition	Check							
Radiator <sup>(6)</sup>		Clean							
Fuel Filter		Change							
Air Cleaner Outer Element <sup>(6)</sup>		Change							
Fuel Diaphragm Pump		Check							
Air Cleaner Inner Element		Change							
Fuel Diaphragm Pump		Change							
Fuel Pre Filter Element		Change							
Cooling System		Drain & Fill							
V Belts		Change							
Injectors <sup>(7)</sup>		Change							
High Pressure Fuel Lines		Inspect							

Note: ☐ First Interval Hr Service only during engine running in period.

<sup>1</sup> The oil level should be checked twice a day for the first 250 hours then once a day is sufficient.

<sup>2</sup> Check & change if noticeable performance related problems due to fuel restrictions.

<sup>3</sup> If the specified intervals between oil changes have not been reached the oil should be changed at least once a year

<sup>4</sup> If operating under arduous conditions do an oil flush & change the engine oil & filter every 250 hours.

<sup>5</sup> The oil service interval will be affected if there is a high sulphur content in the fuel. Refer to fuels & lubricants section.

<sup>6</sup> If operating in dusty adverse conditions do these jobs more frequently.

<sup>7</sup> These jobs must be done by a qualified engineer.



## Service Schedules

<b><i>WHEEL MOTORS</i></b>		Operation	10 Hr	50 Hr	<input type="checkbox"/> 100 Hr	1000 Hr	2000 Hr
<b>Service Points &amp; Fluid Levels</b>							
Hubs	Check for Leaks		<input type="checkbox"/>		<input type="checkbox"/>		
Tightness of Axle Mounting bolts (Torque to 244Nm /180lbf ft)			<input type="checkbox"/>				
Tightness of Motor Mounting bolts (Torque to 135Nm /100lbf ft)			<input type="checkbox"/>				
Tightness of Wheel Rim Nuts (Torque to 170Nm /125lbf ft)			<input type="checkbox"/>				

<b><i>Hydrostatic Drive &amp; Hydraulics</i></b>		Operation	10 Hr	50 Hr	100 Hr	500 Hr	1000 Hr
<b>Pre-start Cold Checks</b>							
Hydraulic oil level	Check						
Return to tank filter element	Change			<input type="checkbox"/>			
Suction strainer (wash with paraffin if necessary)	Change						
Hydraulic Oil	Change					<input type="checkbox"/>	
<b>Functional Test</b>							
Forward & Reverse Direction Change operation	Check				<input type="checkbox"/>		
Neutral Start Operation	Check				<input type="checkbox"/>		
<b><i>BRAKES</i></b>							
Parking Brake Operation	Check						

Note: ☐ First Interval Hr Service only.

<b><i>AIR INDUCTION SYSTEM</i></b>		Operation	10 Hr				
Check air filter restriction indicator	Check		<input type="checkbox"/> <input type="checkbox"/>				

Note: ☐ Every 10 hours.

## Service Schedules

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<b><i>DUMPER CHASSIS</i></b>	<b>Operation</b>	<b>10 Hr</b>	<b>50 Hr</b>	<b>100 Hr</b>	<b>500 Hr</b>	<b>1000 Hr</b>
<b>Grease Points</b>						
Skip Pivot Pins (1 Pin, 2 No Points)						
Hi Lift Arm Pins (4 No Points)						
Parallel Link Arm Pins (2 No Points)						
Tipping Ram Pins (2 No Pins)						
Hi Lift Rams (4 No Points)						
Centre Point Articulation Casting (2 No Points)						
Steering Ram (2 No Points)						

# Torque Settings

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Use these torque settings only where no torque setting has been specified in the text. Values are for dry threads and may be within 3% of the figures stated. For lubricated threads the values should be reduced by one third.

<b><i>UNF Grade “S” Bolts</i></b>				
Bolt Size		Hexagon (A/F)	Torque Settings	
in	(mm)	in	Nm	lbf ft
1/4	6.3	7/16	14	10
5/16	7.9	1/2	28	20
3/8	9.5	9/16	49	36
7/16	11.1	5/8	78	58
1/2	12.7	3/4	117	87
9/16	14.3	13/16	170	125
5/8	15.9	15/16	238	175
3/4	19	1 1/8	407	300
7/8	22.2	1 5/16	650	480
1	25.4	1 1/2	970	715
1 1/4	31.7	1 7/8	1940	1430
1 1/2	38.1	2 1/4	3390	2500
<b><i>METRIC Grade “8.8” Bolts</i></b>				
		Hexagon (A/F) mm		
M5	5	8	7	5
M6	6	10	12	9
M8	8	13	28	21
M10	10	17	56	42
M12	12	19	98	72
M16	16	24	244	180
M20	20	30	476	352
M24	24	36	822	607
M30	30	46	1633	1205
M36	36	55	2854	2105
<b><i>METRIC Grade “12.9” Bolts</i></b>				
M8	8	13	48	35
M10	10	17	94	69
M12	12	19	166	122
M14	14	22	320	236
M16	16	24	400	295

**Note:** All bolts are of high tensile strength and must not be replaced by bolts of a lesser tensile specification.

## Deutz Torque Settings

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Use these torque settings only where no torque setting has been specified in the text. Values are for dry threads and may be within 3% of the figures stated. For lubricated threads the values should be reduced by one third.

Installation	Pre-tightening (Nm)	Re-tightening				Total Nm	Comments
		1st Step	2nd Step	3rd Step	4th Step		
Cylinder head cover						27	
Rocker arm setting screw	-	-	-	-	-	27±2	
Intake elbow	-	-	-	-	-	27	M8 x 125
Air intake pipe	-	-	-	-	-	27	
Exhaust manifold	-	-	-	-	-	27	
Oil drain screw sheet Metal oil tray	-	-	-	-	-	32	M14 x 1.50
Injection valve fastening	-	-	-	-	-	28	
Lube oil filter cartridge	-	-	-	-	-	27	
Starter	-	-	-	-	-	41	

# Fluids & Lubricants

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## ***ENGINE LUBRICATING OIL***

New engines require a running-in period of 200 hours. During this period the dumper should be driven as normal, there is no special need for lower revs, it is OK to drive it a maximum revs but the oil level should be checked twice a day. The dumper should be used in a normal work cycle immediately. Glazing of the piston cylinder bores, resulting in excessive oil consumption, could occur if the engine is gently run in. Under no circumstance should the engine be allowed to idle for extended periods (e.g. warming up without load)

A minimum API CH4 grade of must be used. Superior grades of oil may be more appropriate for heavy duty applications (such as sustained high loads operating at elevated temperatures)

<b>Oil Viscosity</b>	<b>Minimum Temperature °C</b>	<b>Maximum Temperature °C</b>
SAE 0W30	-40	+30
SAE 0W20	-40	+10
SAE 5W20	-30	+10
SAE 5W40	-30	+40
SAE 10W30	-20	+40
SAE 15W40	-15	+50

**NC recommend Fuchs Lubricants, the dumper comes pre-filled with SAE 15W40 oil**  
If you are in any doubt as to the correct grade of oil to use contact NC

## ***ENGINE OIL CAPACITY***

Choose the grade of oil to suit the temperature range as detailed in the table above. The engine oil capacity, including filter and clean sump is approx 5.8L. Never overfill above the top dipstick mark.

# Fluids & Lubricants

## COOLANT MIXTURES



Anti-freeze can be harmful. Obey the manufacturers instructions when handling neat or diluted antifreeze.

An approved list of anti-freeze products are on the following page . If another anti-freeze is used refer to the manufacturers instructions and ensure a corrosion inhibitor is included. Must be ethylene glycol based. DONOT use Organic Acid Technology (OAT) antifreeze. Do not use solutions of more than 45% or less than 35% antifreeze; or damage to the cooling system will occur.

**45% antifreeze : 55% water solution:** maintains protection down to 635°C .

The fresh water must meet the following specifications.

pH value @ 20 deg C	6.5 - 8.5
Chloride-ion content	Max. 100mg/l
Sulphate-ion content	Max. 100mg/l
Total Hardness corresponds to earth alkali content $\text{Ca}^{2+} + \text{Mg}^{2+}$	3 - 20 °dGH 0.54 - 3.56 mmol/l
Carbonate Hardness Corresponds to content of $\text{CaCO}_3$	Min. 3°d Max. 53.4 mg/l



Never use sea water, river or lake water, brackish water or industrial waste water for conditioning the coolant.

Specifications of the water quality are made by the local water board.

The water must be conditioned if it deviates from the above specification. Contact NC for further assistance.

The strength of the anti-freeze solution should be checked at least once a year, preferably at the beginning of a cold period. It is an advantage to leave the anti-freeze in all year round as it gives continued protection against corrosion. Always renew anti-freeze every two years. A 45% anti-freeze mixture is required even if frost protection is not required, as this raises the coolants boiling point.

**Serious damage can be caused to the engine if corrosion inhibitors are not used**

## Fluids & Lubricants

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Supplier	Product Name
Deutz	Cooling System protective agent
Aral	Antifreeze extra
Avia	Antifreeze APN
BASF	Glysantin G48 Protect Plus
ESSO	ESSO Antifreeze Extra
Fuchs (Europe)	Fricifin
Mobil	Mobil Antifreeze Extra
OMV	OMV Coolant plus
Shell	Glyco Shell
Castrol	Castrol Antifreeze NF
Total	Glacelf MDX
Valvoline	G48 Antifreeze
BP	BP Anti-frost code No. X2270A

# Fluids & Lubricants

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## ***FUEL SPECIFICATION***

The quality and grade of fuel can seriously affect the lubrication and overall service life of the fuel injection pump. It is vitally important that the correct grade of fuel is used. Pre-filters and water separators must be checked daily and cleaned if necessary.

## ***ACCEPTABLE FUELS***



**No warranty liability whatsoever will be accepted for failure of injection equipment where the failure is attributed to the quality and grade of fuel used.**

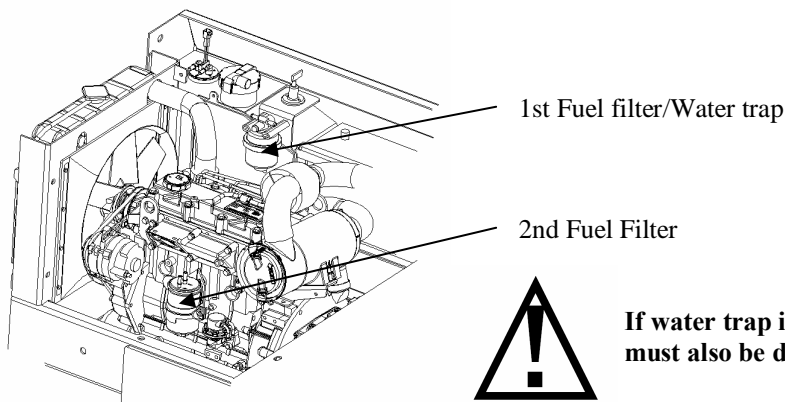
**Only the following types of fuel are considered acceptable by NC**

- EN590 Diesel fuel types (Auto/C0/C1/C2/C3/C4)
- ASTM D 975-88 grade no. 1-D & 2-D
- NATO code F-54
- JIS K2204 grade 1 & 2

## ***EFFECT OF FUEL CONTAMINANTS***

**DIRT:** A severely damaging contaminant. Finely machined and mated surfaces such as delivery valves and distributor rotor are susceptible to the abrasive nature of dirt particles. Increased wear will almost certainly lead to greater leakage, uneven running and poor fuel delivery.

**WATER:** Water can enter the fuel through poor storage or careless handling and will condense in fuel tanks. The smallest amounts of water can result in effects that are just as disastrous to the fuel injection pump as dirt, causing rapid wear, corrosion, and in severe cases even seizure. It is vitally important that water is prevented from reaching the fuel injection equipment. The filter/water trap must be inspected daily and drained if necessary.



**If water trap is full of water, the 2nd fuel filter must also be drained.**

**WAX:** Wax is precipitated from diesel fuel when the ambient temperature falls below that of the fuels cloud point, causing a restriction in fuel flow, resulting in rough engine running. Special winter fuels (Super Diesel) may be available for engine operation at temperatures below 0°C. These fuels have a lower viscosity and limit wax formation.



# Fluids & Lubrication

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## ***HYDRAULIC OIL***

HVZ 46 High Viscosity. (Blue Colour) DIN51524-3 Viscosity index 150

**DONOT USE ZINC FREE HYDRAULIC OILS**

## ***GENERAL GREASE POINTS***

Multi purpose grease

# **FOR YOUR SAFETY**

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## ***IF THE DUMPER DEVELOPS A FAULT***

- Park the machine in a safe area if possible. If this is not possible take measures to warn others of the machine position.
- Remove the start switch key.
- Contact a qualified person to rectify the fault.
- Do not place any part of the body in any area of the machine where there is a hydraulic leak while the system is pressurised.

## ***THE REPAIR AREA***

- The repair area should be level, clean, dry, well ventilated and have adequate lighting
- Keep the floor clean, wipe up spilt oil and grease.
- Always use the correct tool for the job, keep tool in good condition.  
NEVER IMPROVISE TOOLS.
- Jacks, hoists, lifting chains and ropes should be checked before use. Do they have sufficient lifting capacity and are they properly certified.
- Do not attempt to lift heavy objects on your own.

## ***WHEN REPAIRING***

- Safety prop raised / tipped skips.
- Always wear eye protection.
- Always wear ear protectors when in a noise environment.
- Release any pressure from the hydraulic system before carrying out repairs.
- If the machine is lifted or suspended always support the machine on suitable blocks.
- Always remove the start switch key to prevent accidental starting.
- Never work with the engine running unless absolutely necessary.
- Never start the engine unless in a well ventilated area. Carbon Monoxide fumes can KILL.
- Always exercise extreme caution when welding, grinding or burning against risk of fire. Keep suitable fire extinguishers near by.
- Never smoke or leave the engine running when refuelling.
- Always use genuine spares from NC Engineering.
- Always check and test the machine thoroughly before putting it back to work.

**Observing these points will help to ensure the repair of the dumper is as safe as possible. Only trained persons should carry out repairs.**

# Maintenance

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## ***BEFORE YOU START***

- Clean the machine before starting any maintenance.
- Allow the machine to cool.
- Ensure strict cleanliness is observed at all times.
- Do not smoke near any fluids.
- Beware of scalding from hot oils, check oil temperature before draining.
- When checking fluid levels on dumper, ensure the machine is switched off, positioned on firm stable ground, with the handbrake applied. The area should be well ventilated, and free from all sources of possible contamination (i.e. quarry dust, grinding sparks or similar). Never check fluid levels near naked flames or hot surfaces.

## ***CLEANING***

- When cleaning it is preferable to use a biodegradable cleaner.
- Do not use solvents or similar products, which can damage rubber and plastics.
- Take care to clean the oil and fuel tank filler necks.
- Areas around drain plugs should also be cleaned.
- Never direct a pressurised water jet on electrical equipment.

## ***CHANGING OILS***

- Ensure the machine is on solid level ground.
- Only carry out lubrication tasks in a clean area free of contamination of the air.
- Draining of oils is best carried out when they are warm NOT HOT.
- Clean up spilt oil immediately.
- Use only fresh oils of the recommended type and grade.
- Contaminated water / Fluids / Oils / Filters must be disposed of in an environmentally safe way.

## ***WORKING ON THE HYDRAULIC SYSTEM***



**Never attempt to tighten or loosen hydraulic fittings when the engine is running. Hydraulic oil leaks at high pressure can easily penetrate the skin. If the skin is penetrated with hydraulic oil, seek expert medical attention immediately.**

When removing hoses from the machine always cap them with a clean cap and also the port on the component must be capped to prevent dirt getting into the system.

**It is not the dirt you can see will cause the damage it is the particles invisible to the human eye. ALWAYS CAP hoses & components.**

**ALL COVERS AND PANELS MUST BE FITTED BEFORE DUMPER IS USED.**

# Maintenance

## BATTERY LOCATION

The battery is located in the left-hand side under the engine cover (B). It is accessed by unlocking latch (A) on the panel and then pulling lifting it up upwards.

## BATTERY

- Always wear safety glasses when working on the battery.
- Always disconnect the Negative (-) battery lead (C) before disconnecting the Positive (+) battery lead (D).
- Always connect the Positive (+) battery lead (D) first when reconnecting the battery.
- Never allow a metal object to touch both battery terminals at the same time or allow them to touch the positive (+) terminal (D) and the vehicle chassis simultaneously.
- When charging the battery hydrogen gas is produced. Ensure the area is well ventilated to prevent risk of explosion from a build up of hydrogen. Do not smoke, weld, cut, grind etc in the vicinity of a battery being charged.
- If the skin is exposed to battery electrolyte, the affected skin must immediately be washed with running water.
- If eyes are exposed to battery electrolyte, wash the eyes with running water and obtain immediate professional medical attention.
- To remove the battery, disconnect the leads and undo the nuts & bolts (E) holding the clamping bar. Always use the lifting handles when moving a battery

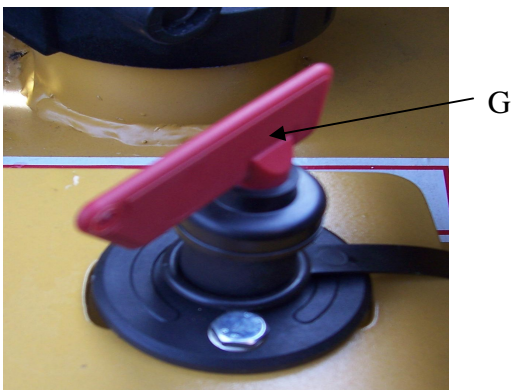
## BATTERY ISOLATOR

The battery isolator must always be used when carrying out service or maintenance work. It would be dangerous if the engine was to be started or the electrical system activated.



**When major maintenance work is being carried out, always disconnect the battery removing the negative battery lead first.**

When the battery isolator lever is in the ON (F) position the machine electrical circuit is fully activated. The battery isolator lever may be removed when in the OFF position (G) and may be used for anti theft protection.



# Maintenance

## AIR CLEANER SERVICING

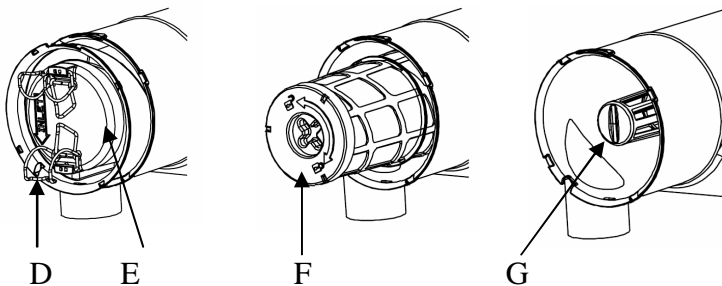
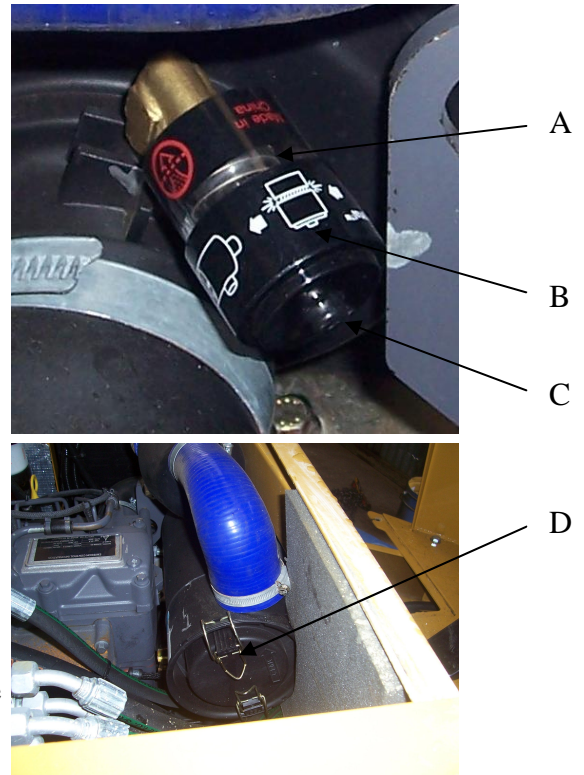
The air cleaner needs serviced when red fills the window (A) on the visual indicator (B) reads 25 kpa. This should be one of the daily machine checks.

Maximum protection for the engine against dust is possible only if the air cleaner is serviced correctly. The only way to determine if an air cleaner requires cleaning or replacing is to check.

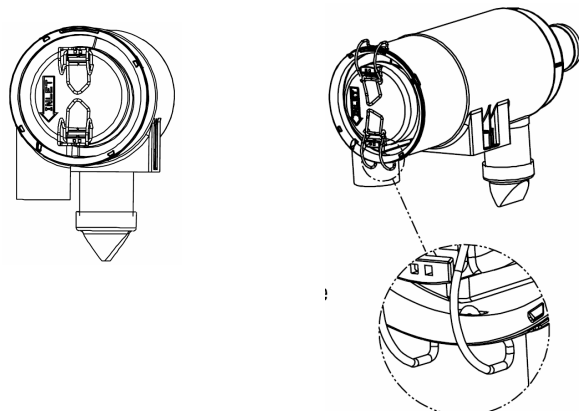
When the air cleaner has been serviced press the button (C) to reset the indicator.

**Never run the engine with the filtration elements removed from the air cleaner.**

- Squeeze the solids ejector to remove material from the pre cleaner drop tube.
- To service the air cleaner, first clean its surrounding area and then release the 2 retention latches (D) holding on the end cover (E).
- Remove the primary filter (F) by pulling it out from the main filter body, this will expose the inner safety filter (G). Either renew or clean these elements. Clean by using compressed air to carefully blow dust out of the filter.
- Reassemble by reversing the above procedures .



- Replace the service cover. The 'INLET' arrow should line up with the air cleaner inlet. DO NOT force cover onto air cleaner. The cover should go on with no extra force. If cover is not flush to the body, the filter is not properly seated in the housing.



# Maintenance

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## ***CHECKING COOLANT LEVEL***



**Always check the coolant level when engine is cold**

**This is a pressurised cooling system**

**To prevent scalding NEVER remove the filler cap when the coolant is hot  
Hot coolant will burn you. Always check the engine is cool before checking  
the coolant level or draining the system.**

- When the engine is cold check the coolant level by unscrewing the radiator cap (A), and add coolant until the coolant is just below the top of the filler neck
- Replace the expansion tank filler cap (A).

## ***DRAINING THE COOLING SYSTEM***

- Ensure the engine is cold carefully undo the pressure cap (A) on the radiator to release any built up pressure escape, Remove the cap when all the pressure is released.
- Undo the hose clip on the bottom radiator hose and pull it off the radiator.
- Allow the coolant to drain into a suitable container.
- Flush the system by pouring clean water into the radiator filler neck.
- Refit the bottom hose and tighten the clip.



A

Dispose of used coolant in an environmentally safe way

## ***REFILLING THE COOLING SYSTEM***

- Ensure the engine is cold.
- Remove the radiator cap and add coolant mix to just below the top of the filler neck on the radiator, allowing time for the coolant to settle as necessary. Replace the filler cap. (see **Fluids & Lubricants** section regarding coolant mix).
- Start the engine and allow it to run for approximately 2 minutes.
- With the engine stopped and the cool, remove the filler cap and top up as necessary to just below the bottom of the filler neck. Repeat the above process and topping up again until the level remains steady. This will ensure all the air has been expelled from the system.



# Maintenance

## *CHECKING ENGINE OIL LEVEL*



**Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice immediately. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin.**

- Clean away all dirt from around the dipstick and tube.
- Ensure the engine oil is warm (NOT HOT) and dumper is positioned on firm, level ground.
- Pull the dipstick (A) from the engine, wipe the oil off the dipstick using clean paper roll.
- Put the dipstick back into its tube and push it firmly down. Remove the dipstick and check oil level.
- Check the oil level is between the two marks on the dipstick.
- If necessary add recommended oil through the filler point (B)



**If the oil is below the recommended level DO NOT use the dumper until sufficient oil has been added to bring it up to the required level**

## *ADDING OIL*

- Unscrew the engine oil filler cap (B) and add clean fresh oil of the correct grade (see technical specification). Ensure the oil is from a clean source and the container is clean.
- Check the oil level frequently when adding oil: too much oil can damage the engine. Allow time for the oil to drain to the sump before checking the level.
- When the oil level is up to the full mark on the dipstick, refit the engine oil filler cap and ensure the dipstick has been firmly pushed back into the dipstick pipe.



# Maintenance

## *DRAINING ENGINE OIL*



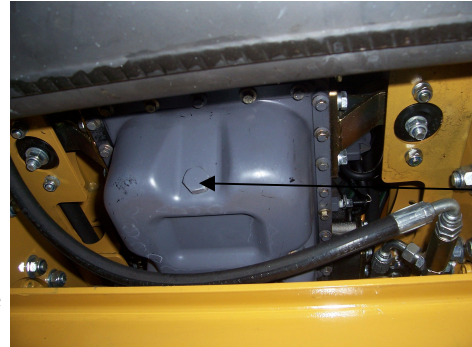
**It is illegal to pollute, drains, sewers or the ground. Clean up all spilt fluids and or lubricants. Used fluids and or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use authorised waste disposal sites.**

- Ensure the oil is warm but not hot as contaminants held in suspension will be drained with the oil. This will also allow the oil to drain quicker and more thoroughly.
- Place a suitable receptacle under the engine drain plug 15 to 20L capacity



**Oil will gush from the hole when the drain plug is removed. Hot oil and engine components can burn you. Keep to one side when you remove the plug.**

- Remove the drain plug (A) and its O-ring. Let the oil drain out, then clean and refit the drain plug with a new O-ring. Torque tighten the drain plug to 32Nm (24lbf ft).
- Loosen anti-clockwise and remove the filter. Let the oil drain out, The engine oil filter (B) **MUST** be changed when the engine oil is renewed. Unscrew the filter canister using a chain wrench if necessary.
- Clean the seal face of the filter head.
- Smear the seal on the new filter canister with clean engine oil, screw the filter on until it just contacts the filter head. Tighten the filter at another 1/2 of a turn.
- Check the seal of the filter for tightness



A



B

A

**NOTE: use only genuine filters from NC. Using non genuine parts may result in loss of engine oil pressure and subsequent engine damage.**

- Through the filler point, fill the engine with the recommended oil to the MAX mark on the dipstick. Wipe up any spilt oil and replace the filler cap ensuring it is secure.
- Operate the engine until the 'Low Oil Pressure' warning LED goes out. Check for oil leakage. When the oil has cooled check oil level again and if necessary top up with clean engine oil. **DO NOT OVERFILL.**



# Maintenance



Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice immediately. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin.

## ***HYDROSTATIC DRIVE OIL***

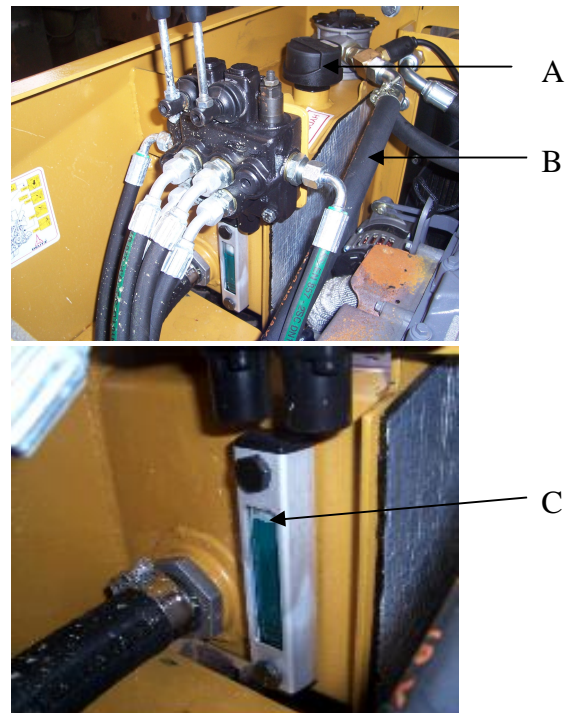
To ensure proper lubrication and operating temperatures of the drive pump & wheel motors it is important that the appropriate grade of lubricants are used and the correct oil level maintained. This level should be checked daily.

NC recommend HVZ 46 High Viscosity. (Blue Colour) Hydraulic oil to DIN51524-3.

**DO NOT use zinc free hydraulic oil.**

## ***HYDRAULIC OIL LEVEL CHECKING***

Ensure the engine is stopped. Ensure the oil cooler and hydraulic hoses are full by running the dumper a few minutes prior to checking the oil level. In this condition the oil level should always be above the suction strainer in the tank, ideally just below the top (C) of the visual indicator. Do not over fill the hydraulic tank as it needs room to vent air. The oil level should be checked daily, and topped up if necessary. Overfilling may cause oil leaks.



# Maintenance

## ***TOWING PROCEDURE***



The dumper may only be towed using suitable towing equipment such as a towing bar or cable. These must be fixed to either the towing hitch (optional) or the tying down eyes at the front or rear axle.

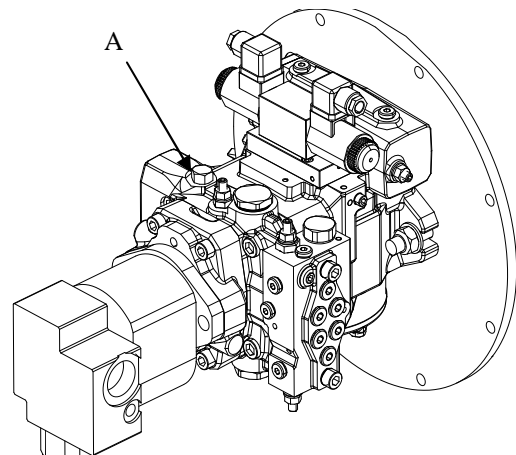


The dumper may only be towed when the following steps have been carried out. Failure to observe these tasks will invalidate any remaining warranty and seriously damage the hydrostatic drive pump and wheel motors.

- Open the high pressure circuit on pump
- Parking brakes released on both wheel motors
- Max Towing speed: 2 Km/h
- Max towing distance: 1 Km

## ***OPENING THE HIGH PRESSURE CIRCUIT***

- Unscrew bypass valve (A) by 2 turns

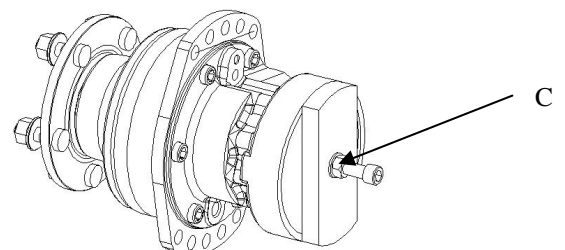
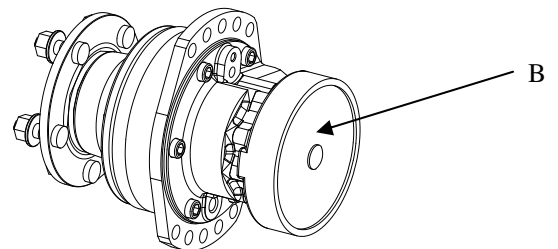


## ***RELEASING PARKING BRAKES***



Ensure the dumper is on a level surface and that the wheels are chocked to prevent it rolling away.

- Remove & dispose of the rubber plug from the brake protector (B).
- Place the 25mm steel flat over the drum.
- Tighten the bolt to the bottom of the threading in the wheel motor.
- Tighten the nut (C) until the motor shaft turns freely, while holding the screw.
- After releasing always insert a new rubber plug.



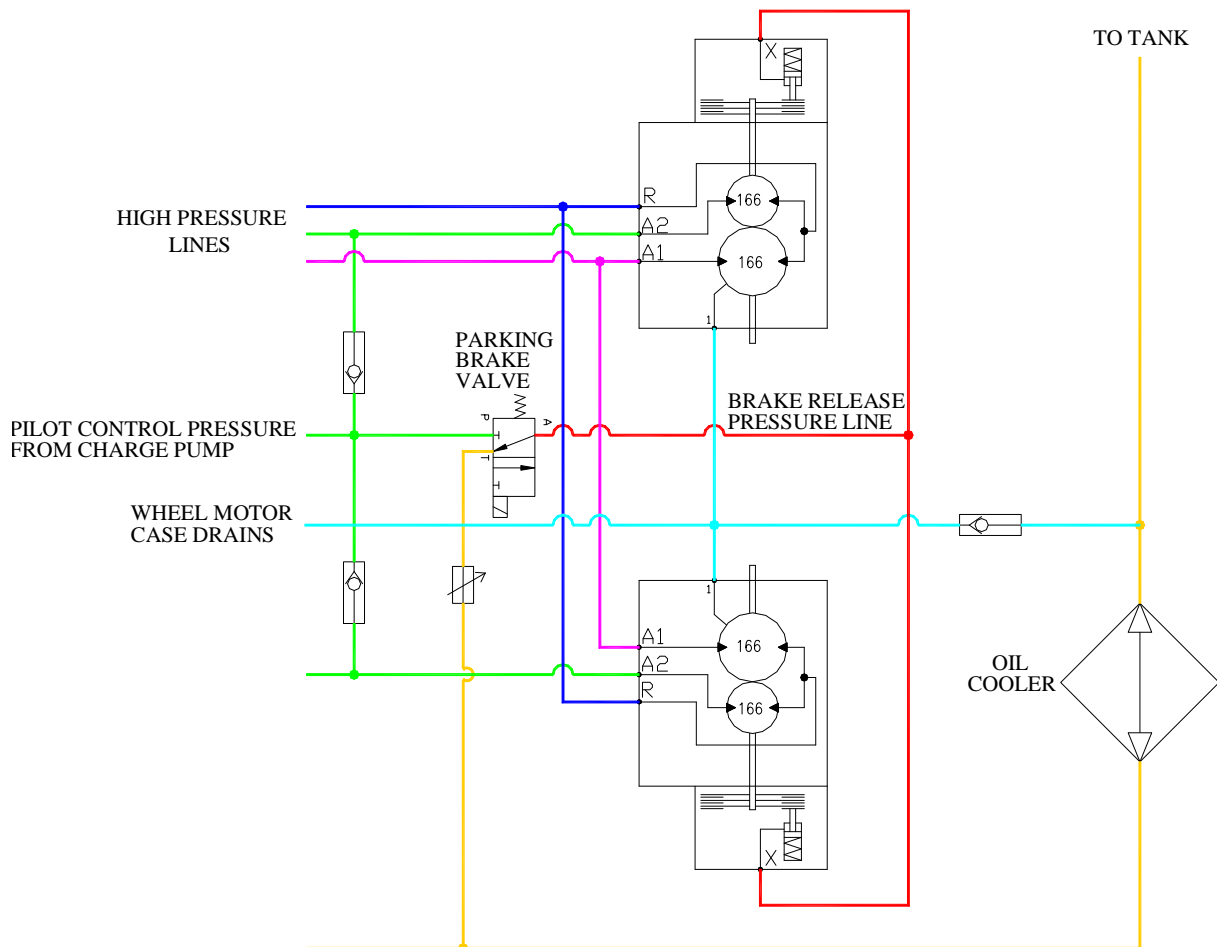
# Maintenance

## ***BRAKE SYSTEM***



The main brake system on this dumper is provided by hydrostatic retardation by releasing the accelerator pedal. The parking brake is automatically applied when accelerator pedal is released, this will act as a secondary emergency brake.

**THE BRAKES ARE ALWAYS ON UNLESS THE ACCELERATOR PEDAL IS PRESSED DOWN WHEN THE DUMPER IS STARTED.**



When the accelerator pedal is pressed a switch is activated which sends a signal to energise the solenoid on the brake release valve. This links the pilot pressure from the charge pump of the hydrostatic drive pump to release the brakes.

When the pedal is released the switch sends a signal to de-energise the solenoid valve. This removes the pilot pressure and the brake springs in the wheel motors push out the brake pads. This is time dependant and for a smoother operation a restrictor is used in the hydraulic tank return line, ensuring softer engagement of the brakes.

# Maintenance

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## ***HYDRAULIC SYSTEM***

The hydraulic system provides power to the driven wheels, steering, hi-tip and skip tip functions. The hydraulic tank is made from steel and forms part of the structure of the dumper.

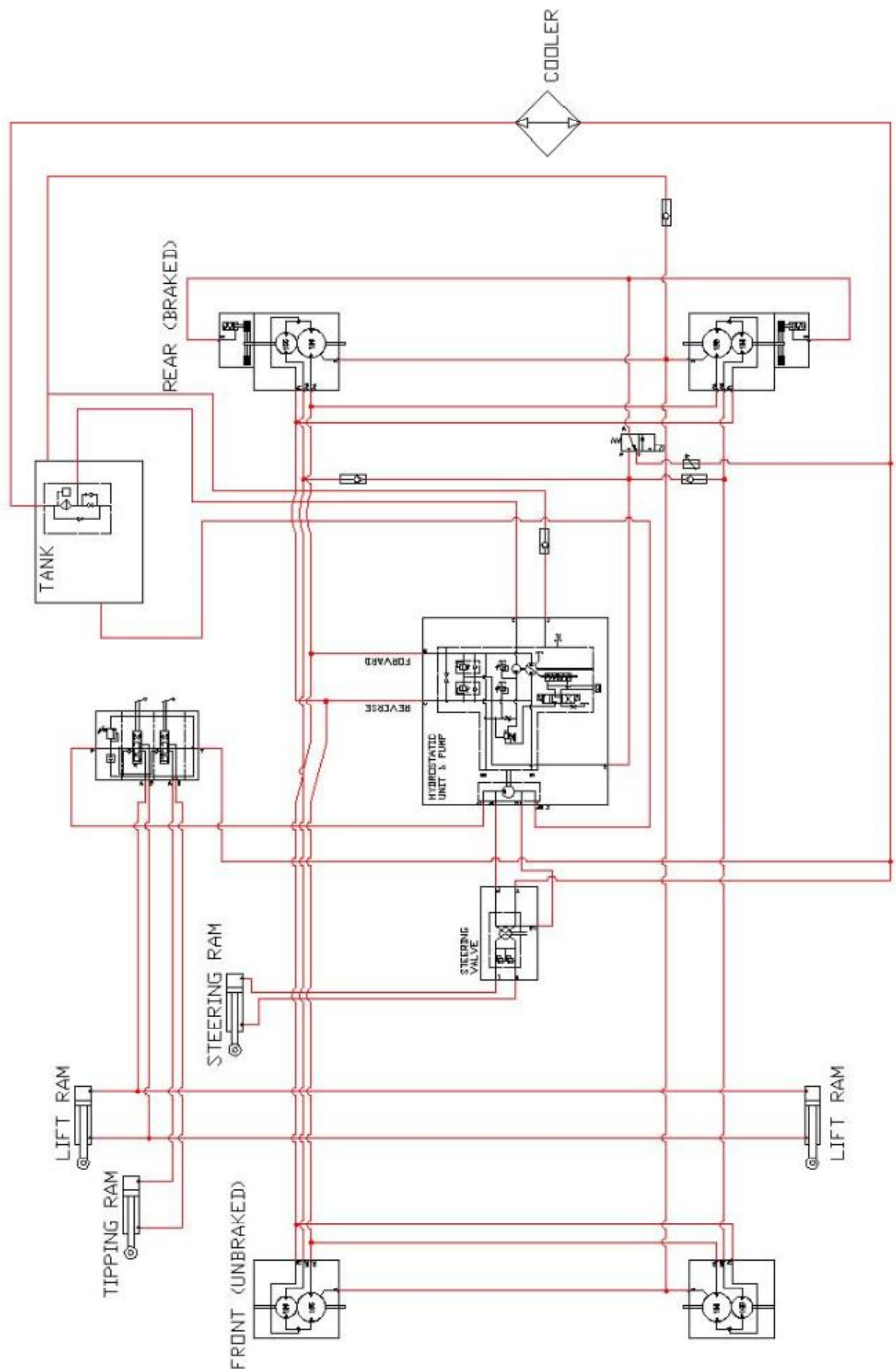
The hydraulics system comprises of a axial piston pump providing the power for driving the wheels of the dumper and a small gear pump mounted to the end to power the main steering, tipping and hi-lift functions of the dumper.

The axial piston pump draws oil through a suction flow/return flow filter unit. This filter unit ensures the pump always ensures a positive pressure of 0.5 bar to the pump. This pre-charge improves start up and cold start characteristics of the dumper and the risk of cavitation can significantly reduced.

The gear pump draws oil through a suction strainer element and feeds the steering and main hydraulic functions of the dumper. The gear pump incorporates a load sensing valve for the steering, and also has two outlets one for the steering and one for the main system.

Steering of the dumper is by means of a double acting hydraulic cylinder, mounted at each end on the two half's of the chassis with the centre point articulation this cylinder when open and closed will provide the steering lock to lock operation. The supply of oil is governed by a steering valve unit.

See schematic layout on flowing page.



# Maintenance

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## ***HYDRAULICS***

During any hydraulic maintenance extreme care should be taken to ensure cleanliness of the hydraulic circuit. By observing strict hydraulic cleanliness the machine will benefit from fewer hydraulic failures through contamination.

### **ALWAYS**

- Thoroughly clean the machine before any maintenance.
- Use fresh, clean hydraulic oil from a sealed container.
- Ensure old gasket particles and excess sealing compound etc do not enter the system, if they do drain them out.
- Ensure new parts and fittings are kept in sealed bags etc, and they are stored away from any contamination.
- Remove any flaking paint from around the area being maintained.
- Use paper roll not rags to wipe parts
- Inspect the inside of new tanks for debris.
- If removing hoses always cap them and the port they are removed from.

### **NEVER**

- Fit new hoses if both ends do not have a plastic cap fitted to seal them.
- Fit new valves, pumps, motors, filters, etc if all the ports have not been plugged.
- Use dirty containers for oil storage.
- Use dirty containers or funnels for filling the hydraulic system.
- Store hydraulic components on the floor or in areas where welding or grinding is done or in a dirty environment.

## ***HYDRAULIC FILTERS***

The system components are maintenance free other than the following:

- Return flow/ Suction flow filter
- Suction strainer

When renewing these filters, the area around the filter should be thoroughly cleaned before removing the old filters to prevent the ingress of dirt into the hydraulic system. Hydrostatic drive systems need to be run on an exceptionally clean oil. Remember it is the small particles of dirt invisible to the naked eye that does the harm.

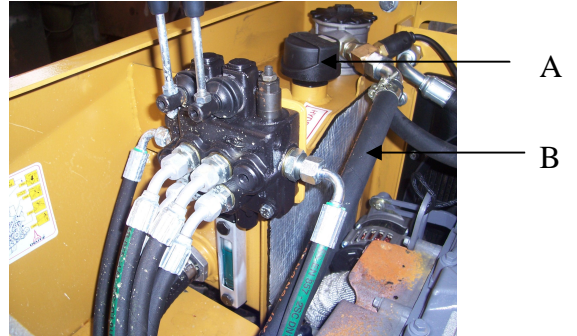


When removing these parts it is recommended the system is drained and refilled with filtered, clean, new hydraulic oil as specified in the **Fluids & Lubricants** section.

# Maintenance

## *ADDING HYDRAULIC OIL*

Remove tank filler cap (A) and add oil. Add clean, filtered hydraulic oil. The oil level should always be above the suction strainer in the tank, ideally just below the top (C) of the visual indicator. Do not over fill the hydraulic tank as it needs room to vent air. Replace filler cap immediately after filling.

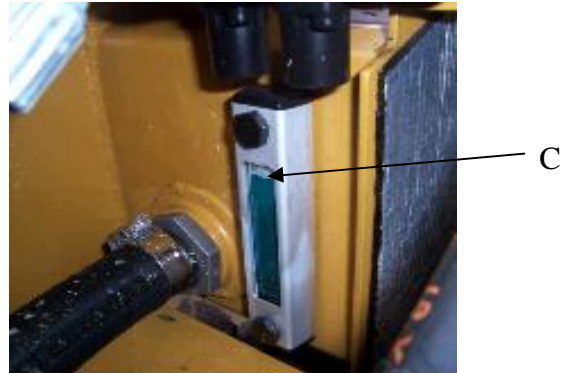


## *CHANGING THE HYDRAULIC OIL*



**Before draining the hydraulic tank ensure the hydraulic oil is warm NOT HOT**

- Lower the skip and the hi-lift sections to their normal fully down positions.
- Stop the engine and allow to cool.
- Release any pressure from the hydraulic lines by moving the levers back and forward several times.
- Remove the bung on the underside of the tank and drain the oil into a suitable container (approx 30L of volume).



**It is extremely important to follow the correct oil fill procedure to prevent internal damage to the hydrostatic drive pump.**

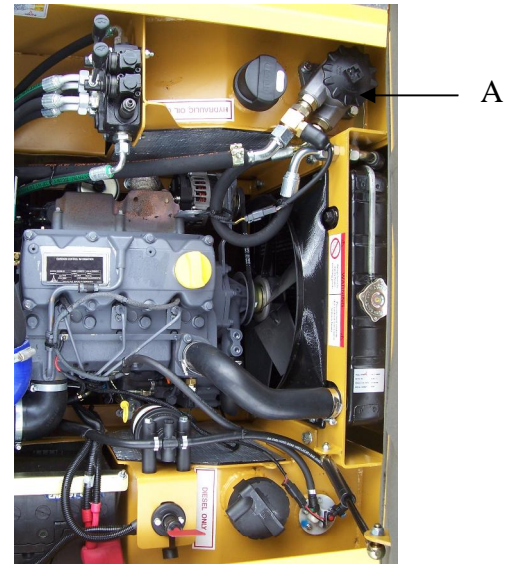
- Fill the hydraulic oil tank with HVZ 46 oil to approx level at (C). Remove hose (B) and manually fill with **clean filtered** hydraulic oil
- Crank the engine over but do not let it start, this will allow the drive pump to get lubricated. Refill hose (B) as above.
- Repeat this procedure about 5 times.
- Start the engine and idle for a period of five minutes. This allows the oil to fill the hoses, oil cooler and filter.
- Stop the engine and wait approximately one minute, recheck the oil level and fill to level as indicated by (C).

# Maintenance

## ***CHANGING THE FILTER ELEMENT***

At the required service interval the element in the RKM suction flow /return flow filter will need changing.

- Unscrew the cap (B) on the top of the RKM filter, there will be oil in this filter, it may spill over on to the tank and will take a few minutes to drain down.
- When the oil has drained down a bit remove part (C) this will leave the element exposed.
- Remove the element (D), it may be a bit tight to remove from its seating in the housing
- Replace with a new element and refit the components (B) & (C).
- Start the dumper and allow to idle for 5 minutes to ensure oil gets into the filter element



## ***REPLACING FILTER ELEMENTS***

**Always use replacement filters supplied by NC other filters may be of lesser quality and lead to increased wear in the hydraulic components resulting in oil leaks.**



# Maintenance

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## ***STORAGE***

If the dumper is to be stored for a long period of time the following procedures should be applied.

- Thoroughly wash down the exterior of the machine and remove any build-up of material.
- Grease all greasing points.
- Start the engine to warm it up. Drain the engine oil and refill with clean fresh oil to the correct specification. Also drain the coolant from the system and replace with fresh coolant of the correct mix & specification.
- Check hydraulic oil level and top up as required.
- Fill the fuel tank to prevent condensation forming inside the tank and contaminating the fuel.
- Store the machine on flat level ground which is not liable to flooding, standing water or airborne contamination.
- Smear any exposed metal parts with grease & rams.
- Remove the battery and store in a safe, well ventilated area. DO NOT store the battery on a concrete floor. It is best to place a rubber mat between the battery and the floor.
- Securely chock the wheels or the dumper may be lifted clear of the ground and placed on suitable axle stands to prevent damage to the tyres. In either case leave the parking brake off.

# Maintenance

## *ELECTRICS*

Description	Specification
Battery	335 Type: 700CCA, 90Ampere-Hour Capacity
Alternator	50A Belt driven

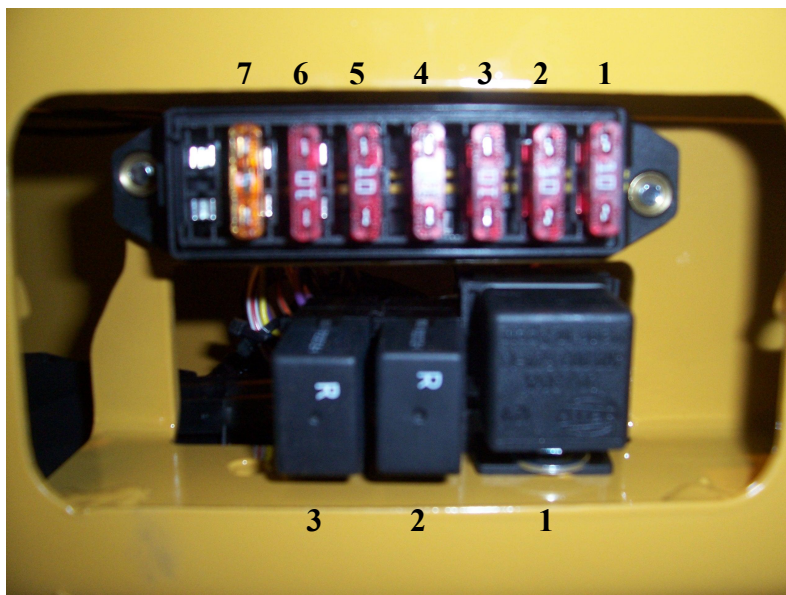


The alternator is very sensitive to temperature. High temperatures will affect the performance of the alternator and may eventually cause damage to it. Never remove the exhaust lagging as this is a temperature resistant material.

If the exhaust is to be removed always ensure it is refitted with lagging of the following minimum specification.

**Must be able to withstand temperatures of 800°C**

## *RELAY & FUSE BOX LAYOUT*



### **Fuses**

1. Fuel Pump
2. FNR Switch
3. Horn
4. Drive
5. Accelerator pedal switch
6. Beacon
7. Instrument Display

### **Relays**

1. Start inhibit relay
2. Reverse drive
3. Forward drive



# Fault Finding

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## *INTRODUCTION*



**The dumper must be correctly parked and prepared. Maintenance personnel must be suitably qualified and trained. Failure to observe these this notice could result in serious injury of yourself or others**

The fault finding procedures are given in the form of flow charts each one dedicated to a particular fault category.

The charts are designed to identify possible causes by performing checks and where applicable specific tests on the dumper. Having identified a cause the suggested remedy is given. The charts are designed to identify causes through a process of elimination, starting with the simplest and most easily rectified faults.

There are many reasons why the dumper may malfunction. Due to the level of effort involved in tracing a fault it is recommended this guide is followed.

- Do not make assumptions.
- Start with the simplest things i.e. no/low fuel, fuses etc.
- Systematically work through each of the possible causes.
- Confirm your diagnosis before dismantling and assembling.
- Follow the recommended repair procedures in the manual.

Some of the tasks in this guide must only be carried out by suitably qualified and competent personnel. For example, fuel injection pump removal and replacement. If you are unsure DO NOT attempt the task.

# Fault Finding

## ***CHART A1—Dumper will not start or difficult to start (no exhaust smoke)***

Cause	Remedy
Electrical isolator not turned on.	Turn isolator on.
Not in Neutral.	Check the FNR lever is in the NEUTRAL position.
No fuel in tank.	Check the level in the fuel tank and replenish as required.
Display gauge not powering up.	<ul style="list-style-type: none"> <li>• Check battery.</li> <li>• Check main line fuses 30A &amp; 100A.</li> <li>• Check fuses in fuse box behind the steering column plate.</li> </ul>
Display powering up but not starting engine.	Check the start inhibit relay behind the steering column plate.
Electrical fuel shut-off solenoid (ESOS) valve not functioning properly.	Check for correct operation of the ESOS.
Fuel filter blocked with water or other contamination.	Drain fuel/water separator or replace fuel filter.
Fuel lift pump not operating correctly (fuel supply inadequate).	Check that the lift pump is operating and delivering fuel to the injection pump.
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
Check the fuel inlet restriction.	Maximum inlet restriction to the fuel transfer pump must not exceed 0.1 Bar
Air intake or exhaust system is blocked.	Visually check the air intake and exhaust intake for blockage or obstruction, remove as required. Check the air filter elements for signs of blocking, replace as required.
Fuel drain return line blocked or not connected properly.	Verify that the fuel return line is not obstructed and connected to the top of the fuel tank.
Fuel filter(s) blocked, fuel supply restricted.	Check/replace the fuel filter(s). Check fuel lines for restriction
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	<p>Check for operation of the FIP.</p> <p>The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)</p>
Injection pump timing incorrect.	<p>If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed.</p> <p>The timing can only be checked by a FIE specialist using the correct equipment.</p>
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.

## Fault Finding

### ***CHART A2—Dumper will not start or difficult to start (exhaust smoke)***

Cause	Remedy
Cold starting aid not working (if fitted).	Check for the correct operation of the cold start advance.
Intake air insufficient.	Visually check the air intake and exhaust intake for blockage or obstruction, remove as required. Check the air filter elements for signs of blocking-replace as required.
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
Fuel lift pump not operating correctly (fuel supply inadequate).	Check that the lift pump is operating and delivering fuel to the injection pump.
Fuel is contaminated or incorrect grade of diesel used.	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Fuel filter(s) blocked, fuel supply restricted.	Check/replace the fuel filter(s). Check fuel lines for restriction.
Fuel drain return line blocked or not connected properly.	Verify that the fuel return line is not obstructed and connected to the top of the fuel tank.
Check the fuel inlet restriction.	Maximum inlet restriction to the fuel transfer pump must not exceed 0.1 Bar
Injection pump timing incorrect.	If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed. The timing can only be checked by a FIE specialist using the correct equipment.
Inlet and exhaust valve clearances set incorrectly.	Set the valve clearances to the recommended clearances.
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Engine compression low in one or more cylinders.	Check the engine compression.
Cranking speed too slow.	Refer to <b>Chart A3</b> for possible low cranking speed faults.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	Check for operation of the FIP.  The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)

## Fault Finding

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### ***CHART A3—Engine will not crank or cranks slowly***

Cause	Remedy
Starting electrical connections loose or corroded.	Clean and tighten connections.
Battery charge low.	Check battery voltage, charge the battery or replace as required. Make sure that the alternator is functioning correctly and charging the battery.
No electrical connection to the starter solenoid.	Check voltage to solenoid.
Crankshaft rotation restricted.	Manually turn the engine and check for any severe rotational resistance.
Solenoid or starter motor fault.	Replace starter motor.
Starter motor operating but not cranking.	Remove the starter motor and check for broken teeth on the ring gear or broken starter motor spring.

# Fault Finding

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## ***CHART A4—Engine starts then stops***

<b>Cause</b>	<b>Remedy</b>
No fuel supply in tank.	Check the level in the fuel tank and replenish as required.
Engine starting under load.	Check for added loading from malfunctioning accessories or driven units, brakes dragging and other changes in the vehicle loading. Disengage the hydraulic controls.
Idle speed too low for accessories.	Adjust the idle speed. Refer to the machines service manual for correct adjustment procedures and idling speed.
Air intake or exhaust system is blocked.	Visually check the air intake and exhaust intake for blockage or obstruction-remove as required. Check the air filter elements for signs of blocking, replace as required.
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
Fuel lift pump not operating correctly (fuel supply inadequate).	Check that the lift pump is operating and delivering fuel to the injection pump.
Fuel is waxing due to extremely cold weather.	Verify by inspecting the fuel filter. Clean the filter and use acclimatised fuel.
Fuel is contaminated or incorrect grade of diesel used.	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Fuel filter(s) blocked, fuel supply restricted.	Check/replace the fuel filter(s). Check fuel lines for restriction.
Fuel drain return line blocked or not connected properly.	Verify that the fuel return line is not obstructed and connected to the top of the fuel tank.



# Fault Finding

## ***CHART A5—Engine poor running***

<b>Cause</b>	<b>Remedy</b>
Condition occurs only at idle.	Refer to <b>Chart A6</b> for possible poor running at idle faults.
Engine is cold. Cold starting aid is not working.	Check for the correct operation of the cold start advance. If the engine will not reach operating temperature, refer to <b>Chart D3</b> .
Fuel injection lines leaking	Inspect and correct as required leaks in the high pressure lines, fittings injector sealing washers, or delivery valves.  <b>WARNING:</b> Fine jets of fluid can penetrate the skin. Keep face and hands well clear of pressurised fluid and wear protective glasses. If fluid penetrates your skin seek medical help immediately.
Fuel is aerated	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
Fuel lift pump not operating correctly (fuel supply inadequate)	Check that the lift pump is operating and delivering fuel to the injection pump.
Fuel filter(s) blocked, fuel supply restricted	Check/replace the fuel filter(s). Check fuel lines for restriction.
Fuel is contaminated or incorrect grade of diesel used	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Inlet and exhaust valve clearances set incorrectly	Set the valve clearances to the recommended clearances.
Engine compression low in one or more cylinders	Check the engine compression.
Injection pump timing incorrect	If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed. The timing can only be checked by a FIE specialist using the correct equipment.
One or more injector worn or malfunctioning	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel	Check for operation of the FIP.  The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)
Camshaft or tappets damaged	Inspect camshaft and tappets.

# Fault Finding

## *CHART A6—Engine poor running at idle*

Cause	Remedy
Engine is cold. Cold starting aid is not working.	Check for the correct operation of the cold start advance. If the engine will not reach operating temperature, refer to <b>Chart D3</b> .
Idle speed too low for accessories.	Adjust the idle speed. Refer to the machines service manual for correct adjustment procedures and idling speed.
Engine mounts over-tightened, damaged or loose.	Verify the condition of the mounts, and replace/adjust as necessary.
Fuel injection lines leaking.	<p>Inspect and correct as required leaks in the high pressure lines, fittings injector sealing washers, or delivery valves.</p> <p><b>WARNING:</b> Fine jets of fluid can penetrate the skip. Keep face and hands well clear of pressurised fluid and wear protective glasses. If fluid penetrates your skin seek medical help immediately.</p>
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
Fuel lift pump not operating correctly (fuel supply inadequate).	Check that the lift pump is operating and delivering fuel to the injection pump.
Fuel filter(s) blocked, fuel supply restricted.	Check/replace the fuel filter(s). Check fuel lines for restriction.
Fuel is contaminated or incorrect grade of diesel used.	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Inlet and exhaust valve clearances set incorrectly.	Set the valve clearances to the recommended clearances.
Engine compression low in one or more cylinders.	Check the engine compression.
Injection pump timing incorrect.	<p>If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed.</p> <p>The timing can only be checked by a FIE specialist using the correct equipment.</p>
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	<p>Check for operation of the FIP.</p> <p>The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)</p>

# Fault Finding

## *CHART A7—Engine excessive noise*

Cause	Remedy
Drive belt squeal, insufficient tension or abnormally high loading.	Check the tensioner and inspect the drive belt for deterioration. Make sure the water pump, tensioner pulley, fan and alternator turn freely.  Check for paint/oil or other materials on the pulleys. Check the tension of the accessory drive belts.
Cold start advance not working properly.	Check for the correct operation of the cold start advance. If the engine will not reach operating temperature, refer to <b>Chart D3</b> .
Air intake or exhaust leaks.	Refer to <b>Charts A13 &amp; A14</b> .
Fuel is contaminated or incorrect grade of diesel used.	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Inlet and exhaust valve clearances set incorrectly.	Set the valve clearances to the recommended clearances.
Inlet and exhaust valve springs broken.	Check and fit new valve springs.
Worn crank/connecting rod bearings (knocking under load).	Check/replace rod and main bearings.
Excessive camshaft bearing wear.	Check bearings (engine overhaul required).
Worn or damaged pistons and or piston rings.	Check piston assemblies (engine overhaul required).
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Gear train noise.	Visually inspect and measure gear backlash. Replace gears as required.

# Fault Finding

## *CHART A8—Engine compression knocks*

Cause	Remedy
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
Fuel is contaminated or incorrect grade of diesel used.	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Injection pump timing incorrect.	If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed. The timing can only be checked by a FIE specialist using the correct equipment.
Inlet and exhaust valve springs broken.	Check and fit new valve springs.
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Coolant operating temperature incorrect.	Refer to <b>Charts D2 &amp; D3</b> .

# Fault Finding

## *CHART A9—Engine reduced power output*

Cause	Remedy
No fuel supply in the tank.	Check the level in the fuel tank and replenish as required.
Oil level incorrect.	Check oil level.
Engine overloaded.	Check for added loading from malfunctioning accessories or driven units, brakes dragging and other changes in vehicle loading. Disengage the hydraulic controls.
Throttle adjustment incorrectly set or binding.	Check the engine maximum rpm is as specified in the <b>Technical Specifications</b> section. Check the throttle linkages and cable for binding etc.
Fuel is contaminated or incorrect grade of diesel used.	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Fuel injection lines leaking.	Inspect and correct as required leaks in the high pressure lines, fittings injector sealing washers, or delivery valves.  <b>WARNING:</b> Fine jets of fluid can penetrate the skip. Keep face and hands well clear of pressurised fluid and wear protective glasses. If fluid penetrates your skin seek medical help immediately.
Fuel filter(s) blocked, fuel supply restricted.	Check/replace the fuel filter(s). Check fuel lines for restriction.
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
Fuel lift pump not operating correctly (fuel supply inadequate).	Check that the lift pump is operating and delivering fuel to the injection pump.
Air intake or exhaust system is blocked.	Visually check the air intake and exhaust intake for blockage or obstruction-remove as required. Check the air filter elements for signs of blocking-replace as required.
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	Check for operation of the FIP.  The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)

## Fault Finding

### *CHART A9—Engine reduced power output (continued)*

Cause	Remedy
Exhaust leak at the manifold.	Check/correct leaks in the manifold gasket. Look for a cracked manifold.
Extra injector sealing washer installed under injector.	Remove extra injector sealing washer.
Inlet & exhaust valve clearances set incorrectly.	Set the valve clearances to the recommended clearances.
Injection pump timing incorrect.	If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed. The timing can only be checked by a FIE specialist using the correct equipment.
Engine compression low in one or more cylinders.	Check the engine compression.

# Fault Finding

## *CHART A10—Engine will not reach maximum rpm*

Cause	Remedy
Tachometer faulty (if fitted).	Verify the engine speed with a hand held tachometer. Measure on the fan drive pulley and this will be the engine rpm.
Engine overloaded.	Verify high idle speed without load. Investigate operation to ensure correct gear is being used.
Throttle adjustment incorrectly set or binding.	Check the engine maximum rpm is as specified in the <b>Technical Specifications</b> section. Check the throttle linkages and cable for binding etc.
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
Fuel lift pump not operating correctly (fuel supply inadequate).	Check that the lift pump is operating and delivering fuel to the injection pump.
Fuel is contaminated or incorrect grade of diesel used.	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Fuel filter(s) blocked, fuel supply restricted.	Check/replace the fuel filter(s). Check fuel lines for restriction.
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	<p>Check for operation of the FIP.</p> <p>The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)</p>

# Fault Finding

## *CHART A11—Engine rpm surges*

Cause	Remedy
Fuel level low.	Check/fill fuel tank.
If the condition occurs at idle, the idle speed is set too low for the accessories.	Check the engine idle rpm setting.
Throttle adjustment incorrectly set or binding.	Check the engine maximum rpm is as specified in the <b>Technical Specifications</b> section. Check the throttle linkages and cable for binding etc.
Fuel injection lines leaking.	<p>Inspect and correct as required leaks in the high pressure lines, fittings injector sealing washers, or delivery valves.</p> <p><b>WARNING:</b> Fine jets of fluid can penetrate the skin. Keep face and hands well clear of pressurised fluid and wear protective glasses. If fluid penetrates your skin seek medical help immediately.</p>
Fuel tank cap vent/breather blocked.	Inspect & rectify as required. Replace cap if necessary.
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	<p>Check for operation of the FIP.</p> <p>The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)</p>



# Fault Finding

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## ***CHART A12—Engine excessive vibration***

<b>Cause</b>	<b>Remedy</b>
Engine not running smoothly/missing.	Refer to <b>Chart A5</b> .
Oil level over full.	Check oil level.
If the condition occurs at idle, the idle speed is set too low for the accessories.	Check the engine idle rpm setting.
Fan damaged or accessories faulty.	Check/replace the vibrating component. Refer to correct installation procedure and torque figures.
Fan hub faulty.	Inspect/replace the fan hub. Refer to correct installation procedure and torque figures.
Engine mounts loose or broken.	Check/replace the engine mounts. Refer to correct installation procedure and torque figures.
Inlet & exhaust valve clearances set incorrectly.	Set the valve clearances to the recommended clearances.
Engine compression low in one or more cylinders.	Check the engine compression.
Alternator bearing worn or damaged.	Check/replace the alternator.
Flywheel housing misaligned.	Check/replace the flywheel alignment.
Injection pump timing incorrect.	If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed. The timing can only be checked by a FIE specialist using the correct equipment.

# Fault Finding

## *CHART A13—Engine exhaust smoke excessive (Black smoke)*

Cause	Remedy
Engine being lugged down.	Use appropriate gear for the task.
Air intake or exhaust system is blocked.	Visually check the air intake and exhaust intake for blockage or obstruction-remove as required. Check the air filter elements for signs of blocking-replace as required.
Exhaust leak at the manifold .	Check/correct leaks in the manifold gasket. Look for a cracked manifold.
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	Check for operation of the FIP.  The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)
Injection pump timing incorrect. <ul style="list-style-type: none"> <li>Retarded if smokes under load and engine quieter than normal.</li> <li>Advanced is smokes under load and engine noisier than usual.</li> </ul>	If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed.  The timing can only be checked by a FIE specialist using the correct equipment.
Engine compression low in one or more cylinders.	Check the engine compression.

# Fault Finding

## ***CHART A14—Engine exhaust smoke excessive (White/Blue smoke)***

Cause	Remedy
Fuel is contaminated or incorrect grade of diesel used.	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Oil level incorrect.	Check oil level.
Diesel or hydraulic oil in sump.	Check oil consistency. If oil contamination is suspected check hydraulic oil pump for leaks past the seal into the engine. Drain, flush and fill with clean oil.
Coolant temperature too low (over cooling). Light blue or white, high speed/light load.	Refer to <b>Chart D3</b> .
Injection pump timing incorrect. <ul style="list-style-type: none"> <li>• Retarded if smokes under load and engine quieter than normal.</li> <li>• Advanced is smokes under load and engine noisier than usual.</li> </ul>	If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed. The timing can only be checked by a FIE specialist using the correct equipment.
One or more injector worn or malfunctioning. White/blue smoke at operating temperature.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Coolant leaking into combustion chamber.	Refer to <b>Chart D1</b> .
Leaking valve stem seals. Evident after long idle period then acceleration.	Replace valve seals.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	Check for operation of the FIP.  The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)
Piston rings not sealing. Evident with persistent blue smoke at all speeds/loads.	Check the engine compression.

## Fault Finding

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### *CHART A15—Engine will not shut off*

Cause	Remedy
Electrical fuel shut-off solenoid (ESOS) valve not functioning properly.	Check for correct operation of the ESOS.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	<p>Check for operation of the FIP.</p> <p>The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)</p>

# Fault Finding

## *CHART B1—Fuel consumption excessive*

Cause	Remedy
Additional load on engine.	Check/repair accessories and vehicle components.
Operator technique.	Review operation for correct gear shifts, deceleration and idling.
Fuel Leaks.	<p>Check for external leaks and engine lubricating oil dilution. For fuel dilution check for internal leaks at the fuel transfer pump and injection pump.</p> <p>Inspect and correct as required leaks in the high pressure lines, fittings injector sealing washers, or delivery valves.</p> <p><b>WARNING:</b> Fine jets of fluid can penetrate the skip. Keep face and hands well clear of pressurised fluid and wear protective glasses. If fluid penetrates your skin seek medical help immediately.</p>
Fuel is contaminated or incorrect grade of diesel used.	Refer to <b>Fluids &amp; Lubricants</b> section for recommended diesel fuels. If the fuel is suspect, verify by operating the engine with clean fuel from a temporary tank.
Intake air or exhaust leaks.	Refer to <b>Charts A13 &amp; A14.</b>
Engine compression low in one or more cylinders.	Check the engine compression.
Injection pump timing incorrect.	<p>If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed.</p> <p>The timing can only be checked by a FIE specialist using the correct equipment.</p>
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	<p>Check for operation of the FIP.</p> <p>The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)</p>
Inlet & exhaust valve clearances set incorrectly.	Set the valve clearances to the recommended clearances.

# Fault Finding

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## ***CHART B2—Fuel/Oil leaking from exhaust manifold***

Cause	Remedy
Operating for extended periods under light or no load.	Review operation for correct gear shifts, deceleration and idling.
Intake air or exhaust leaks.	Refer to <b>Charts A13 &amp; A14</b> .
Turbocharger lubricating oil drain line obstructed.	Check/clean line.
Exhaust leak at the manifold or turbocharger.	Check/correct leaks in the manifold or turbocharger gaskets. Look for a cracked manifold.
Valve guide seals are leaking.	Replace valve guide stem seals as required.
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Injection pump timing incorrect.	<p>If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed.</p> <p>The timing can only be checked by a FIE specialist using the correct equipment.</p>

# Fault Finding

## *CHART C1—Lubricating Oil consumption excessive*

Cause	Remedy
Oil leaks.	Inspect the engine for visible signs of leaks. Pay particular attention to the seals, gaskets, oil cooler and external connections.
Oil level over full.	Check oil level.
Incorrect lubricating oil. (specification of viscosity).	<p>Make sure the correct lubricating oil is being used, Refer to <b>Fluids &amp; Lubricants</b> section.</p> <p>Look for reduced viscosity from dilution with fuel. Fuel dilution in lubricating oil can originate from fuel injection pump driveshaft seal or fuel transfer pump.</p> <p>Review/reduce the lubricating oil change intervals.</p>
Excessive leaking out of the breather tube (system blocked).	Check the breather tube areas for sign of lubricating oil loss. If necessary replace the breather gauze.
Lubricating oil cooler leak.	Check for lubricating oil in coolant.
Turbocharger leaking lubricating oil into the air intake or exhaust.	Inspect the air crossover tube for evidence of lubricating oil transfer.
Valve guide seals are leaking.	Replace valve guide stem seals as required.
Piston rings not sealing. Lubricating oil being consumed by the engine. (Blue smoke from the exhaust).	Check engine compression.
Worn cylinder bores. Lubricating oil being consumed by the engine. (Blue smoke from the exhaust).	Check engine compression.
Glazed cylinder bores.	De-glaze bores as required.

# Fault Finding

## ***CHART C2—Lubricating Oil contaminated***

Cause	Remedy
Coolant in the lubricating oil, internal engine component leaks.	Refer to <b>Chart D1</b> .
Lubricating oil sludge excessive.	<p>Change oil &amp; filter.</p> <p>Review/reduce the lubricating oil change intervals. If operating in arduous conditions change oil more frequently.</p> <p>Make sure the correct lubricating oil is being used, Refer to <b>Fluids &amp; Lubricants</b> section.</p>
Fuel in the lubricating oil, engine operating too cold.	Review the operation for excessive idling resulting in the engine running below normal temperature.
Fuel lift pump leaking.	Repair or replace the fuel lift pump.
One or more injector worn or malfunctioning.	Check and externally clean the injector. If the problem still persists, the injector must be checked by a FIE specialist or replace with new.
Worn or malfunction fuel injection pump (FIP). Injection pump not delivering fuel.	<p>Check for operation of the FIP.</p> <p>The FIP must be taken to a local FIE specialist to have the fuel delivery timing checked. Ensure that all obvious causes have been eliminated before removing the FIP. (Check with local Deutz agent)</p>
Internal bearing or component damage.	Have oil sample analysed. Repair engine as required.



# Fault Finding

## *CHART C3—Lubricating Oil pressure low*

Cause	Remedy
Incorrect lubricating oil. (specification of viscosity).	<p>Make sure the correct lubricating oil is being used, Refer to <b>Fluids &amp; Lubricants</b> section.</p> <p>Look for reduced viscosity from dilution with fuel. Fuel dilution in lubricating oil can originate from fuel injection pump driveshaft seal or fuel transfer pump.</p> <p>Review/reduce the lubricating oil change intervals.</p>
Pressure switch or gauge fault.	Verify the pressure switch is functioning correctly.
Lubricating oil filter blocked.	<p>Change lubricating oil filter.</p> <p>Review/reduce the lubricating oil change intervals. If operating in arduous conditions change oil more frequently.</p>
Lubricating oil filter drain down valve not fitted.	Change lubricating oil filter.
Suction tube loose or broken seal leaking.	Check/replace seal.
Oil pump pressure relief valve stuck open.	Replace oil pump assembly
Lubricating oil pump worn.	Replace oil pump assembly

## Fault Finding

### *CHART C4—Lubricating Oil pressure high*

Cause	Remedy
Incorrect lubricating oil. (specification of viscosity).	Make sure the correct lubricating oil is being used, Refer to <b>Fluids &amp; Lubricants</b> section.  Look for reduced viscosity from dilution with fuel. Fuel dilution in lubricating oil can originate from fuel injection pump driveshaft seal or fuel transfer pump.  Review/reduce the lubricating oil change intervals.
Pressure switch or gauge fault.	Verify the pressure switch is functioning correctly.
Engine running too cold.	Refer to <b>Chart D3</b> .
Oil pump pressure relief valve stuck closed.	Replace oil pump assembly.

## Fault Finding

### *CHART D1—Coolant loss*

Cause	Remedy
Incorrect coolant level.	Check the level.
Coolant leaking from engine radiator.	Visually inspect the radiator hoses and connections to locate the leak.  If oil is present in the coolant, check for an engine oil cooler leak.
External engine coolant leak.	Visually inspect the engine and components for seal, gasket or hose connection leaks. Make sure all hose clips are in good condition and torqued to the recommended figure.
Overheating or compression gasses leaking, resulting in loss through the radiator overflow.	Refer to <b>Chart D2</b> .
Lubricating oil cooler leak.	Check/replace the oil cooler. Look for coolant in the oil.
Cylinder head gasket leak.	Check/replace the head gasket.
Cylinder head cracked or porous.	Check/replace the head.
Cylinder block coolant passages leaking.	Check/replace the cylinder block.

# Fault Finding

## *CHART D2—Coolant over temperature*

Cause	Remedy
Incorrect coolant level.	Check the level.  Ensure low level is not a result of a coolant leak. Refer to <b>Chart D1</b> .
Radiator matrix blocked with dirt or chaff.	Clean radiator matrix.
Air flow to the radiator restricted	Clean the mesh grill on the bonnet. Check/repair the fan shroud, anti recirculation sealing. Check fan blades replace if necessary.
Coolant pump or fan drive belts loose.	Check/correct the belt tension.
Radiator hose collapsed, restricted or leaking.	Check/replace hose.
Oil level over full.	Check oil level.
Cooling system pressure cap incorrect or faulty.	Check/replace cap.
Over concentration of antifreeze.	Remove some of the coolant from the system and replace with water.
Temperature gauge sensor faulty.	Verify that the gauge and temperature sensor are correct.
Thermostat faulty, incorrect or missing.	Check/replace thermostat.
Air or combustion gasses in the cooling system.	Make sure the fill rate is not exceeded and the correct vented thermostat is installed.  If aeration is continued check for a compression leak through the head gasket.
Coolant pump faulty.	Check routing and operation of vent line.
Vent line from engine and or radiator blocked or incorrectly routed. (sudden overheating).	Check routing and operation of vent line.
Cooling passages in radiator, cylinder head, head gasket or block blocked.	Flush the system and fill with clean coolant.
Fuel inject pump timing incorrect.	If the pump has recently been removed and replaced the timing could be incorrect if the correct removal procedures were not followed. The timing can only be checked by a FIE specialist using the correct equipment.

# Fault Finding

## *CHART D3—Coolant under temperature*

Cause	Remedy
Air flow across radiator excessive.	Check/repair the mesh grill on the bonnet. Check/repair the fan shroud, anti recirculation sealing. Check fan blades replace if necessary.
Temperature gauge sensor faulty.	Verify that the gauge and temperature sensor are correct.
Thermostat faulty, open (not sealing)	Check/replace thermostat.
Coolant not flowing by temperature sensor.  A total coolant loss may result in the gauge showing a low temperature initially.	Check coolant level. Check/clean coolant passages.

## *CHART D4—Coolant contaminated*

Cause	Remedy
Coolant rusty, operating without the correct mixture of antifreeze and water.	Drain and flush the cooling system. Fill with the correct mixture of antifreeze and water.  Review the coolant interval change.
Lubricating oil leaks from lubricating oil cooler, head gasket, head and cylinder block.	Refer to <b>Chart D1</b> .

# Fault Finding

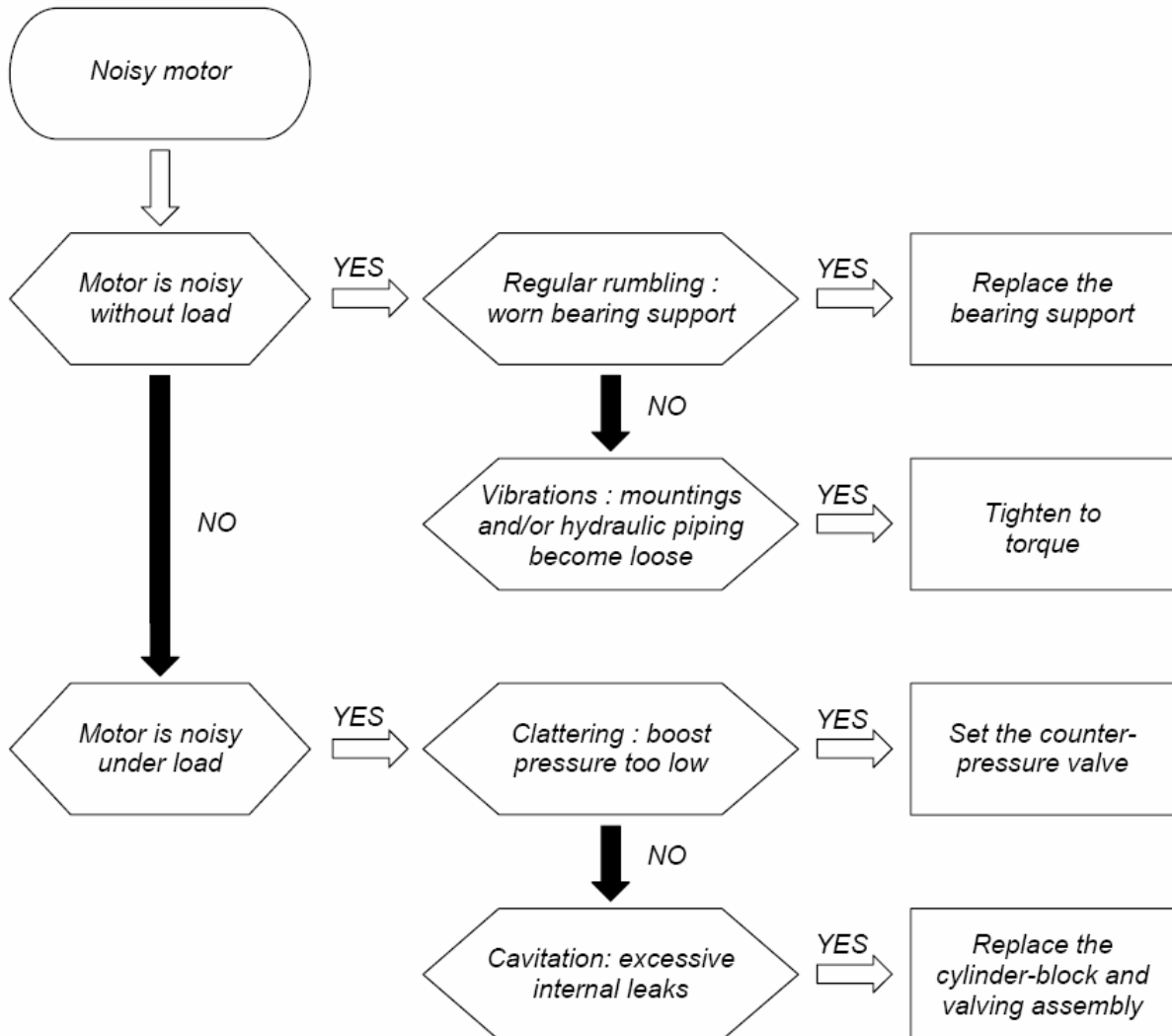
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## ***CHART E1—Poor hydrostatic drive performance***

Cause	Remedy
Poor road speed at full engine revs	Check hydraulic oil level Check move off rpm & adjust if necessary Test pressure on G port on pump Test pressure on ports M1 & M2 on pump Contact NC regarding refurbishment or replacement
Dumper will not move drive	Check FNR lever is engaged Check Fuses & Relays Check continuity of wires to solenoid on pump Test pressure on G port on pump Check the flow from G port on pump

# Fault Finding

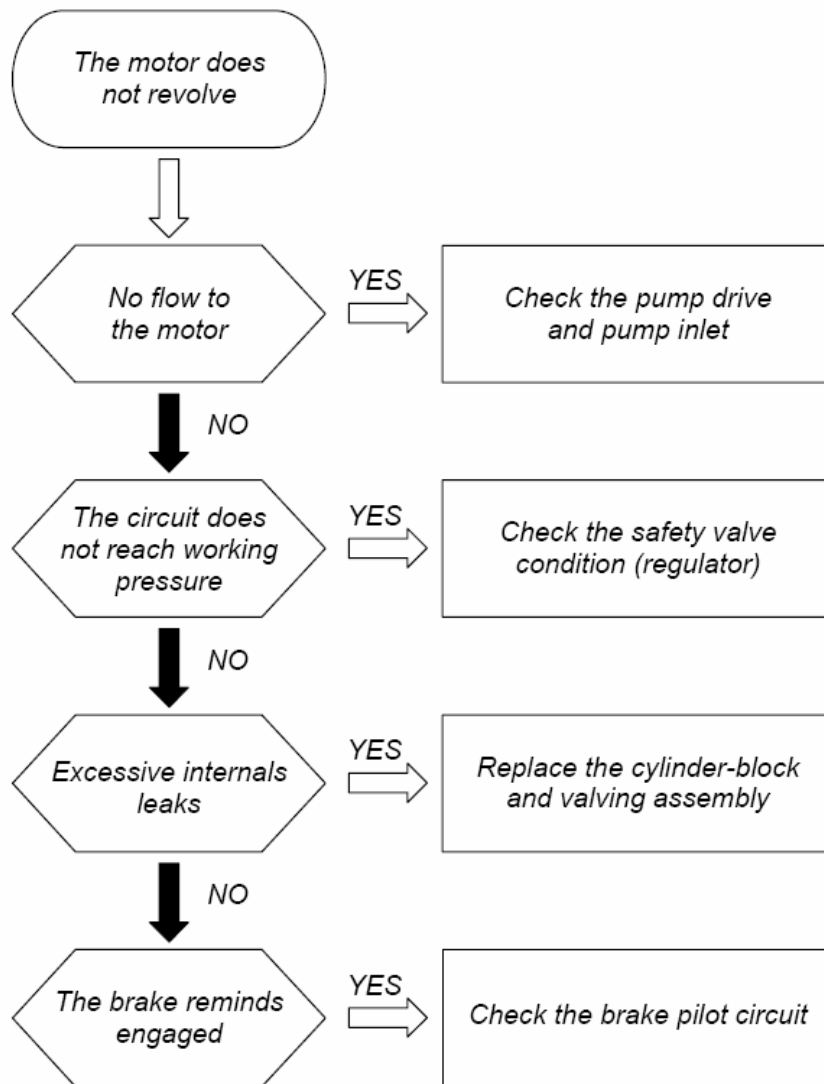
**CHART E2—Noisy wheel motor**



# Fault Finding

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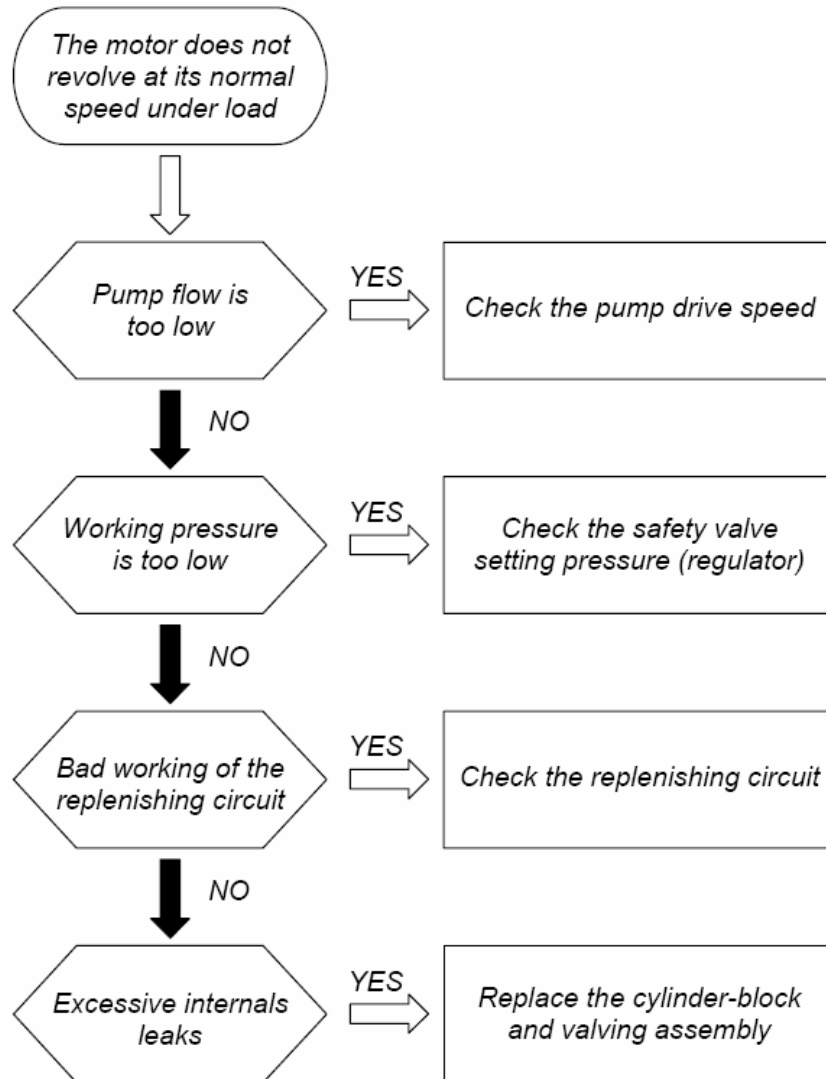
**CHART E3—Wheel motor does not revolve**





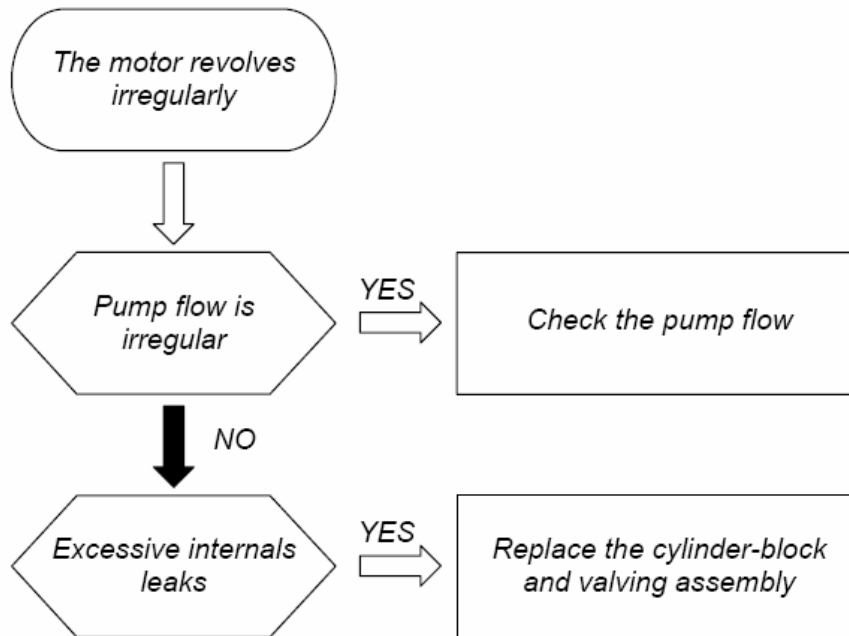
## Fault Finding

**CHART E4—Wheel motor does not revolve at its normal speed under load**



# Fault Finding

**CHART E5—Wheel motor revolves irregularly**



**CHART E6—Wheel motor leaks**

